

A Narrative Inquiry of Critical Moments in Students' Paths to Math Success

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Background

Across all levels of K-12 and postsecondary education, students must manage, contend with, and frequently overcome, a combination of personal and environmental barriers to learning that pose risks to achieving academic success (Adelman & Thyne, 2012).

Students' individual experiences can contribute to a richer understanding of the personal and environmental barriers students experience in learning math; however, student voices are infrequently represented in the literature on math learning.

Narrative inquiry (Clandinin & Connelly, 2000) and narrative autoethnography (Johnson et al., 2012) are research methods that can help researchers understand the lived experiences of students.

Methods

Participants and Recruitment

- Five focus groups ($n = 10$) of diverse participants in college or within two years of graduation
- We recruited from local college campuses' identity-based affinity groups
- Have diverse challenges in learning math to achieve academic success
- Questions included identifying challenges, connecting to their sense of belonging, strategies to overcome, and advice for learners with similar challenges

Codebook

- Experiences related to student, school, family (+/-)
- Supports and resources related to people and content (+/-)

Findings

Thematic Analysis

Challenges	Student Experiences	Persistence to Overcome
Academic	Struggle	Growth
Social	Support	Resilience
Personal	Resilience	Success

Conclusions

Significance

- Presented students' experiences in their own voices
- Highlight factors that may have received less previous attention in research (e.g., sense of ownership and autonomy)
- Capture challenges in math learning more holistically by analyzing multiple challenges across the different focus groups
- Narrative auto-ethnographic excerpts of the instructional and institutional practices that can support or hinder students' learning and well-being

Limitations and Future Research

- Specific to the students who shared their narratives
- Our approach could be generalized to create a richer understanding of personal and environmental barriers students face in learning math

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BACKGROUND/INFO

Across all levels of K-12 and postsecondary education, students must manage, contend with, and hopefully overcome, a constellation of personal and environmental barriers to learning that pose risks to achieving academic success (Adelman & Taylor, 2018).

Students' individual experiences can contribute to a richer understanding of the personal and environmental barriers students experience in learning math; however, student voices are infrequently represented in the literature on math learning.

Narrative Inquiry (Clandinin & Connelly, 2000) and narrative autobiographies (Towers et al., 2017) focus on understanding experiences through the told stories of the participants

Aims of the study: understand the complex interplay of personal and environmental barriers to math learning by examining detailed, first-person experiences of students who overcame challenges to learning math to achieve math success.

FINDINGS

Thematic Analysis



Examples from Transcripts

Causal attributions

Joe (external): "I started in calc two my freshman year instead of calc one and I was like, 'Maybe I should go back to calc one because I'm not understanding any of this,' but then as I realized, most of these [SCHOOL 1] classes, as you get up in them the prerequisites really don't prepare you much for them. And I feel like that is one reason not to go like that, but initially, you always feel like you probably weren't meant for this class, it's kind of too hard and whatnot."

Mario (internal): "Since it was my first year of college transition from high school to college, I didn't know really what to expect...once I saw the level at which my peers were and where I was, someone mentioned AP calc classes in high school and AB and BC. To this day, I have no idea what that is. I know they're classes that you take in high school and it counts credit towards college or something like that, but I never saw anything like that before coming to college. I just felt like I was on a completely different level."

Persistence

Mario: "I think there's definitely a combination between helping yourself and allowing others to help you ... I know the second semester I think I was doing everything I could to help myself in the class, but since I didn't have those questions answered and since I had a lot of doubts that I couldn't answer myself and I wasn't allowing others to help me to some extent, then I wasn't going to be successful. So although I was doing everything I could for myself, I still wasn't allowing third parties to come in and help me. I realized that a lot of the times, although we want the best for ourself and we're trying to do everything ourselves, we have to open up and talk about those struggles with others, in this case, math, so that our professors or TAs or tutors can help us."

Connecting Challenges, Experiences, and Persistence

Causal attributions --> Belonging --> Persistence

- External attributions connected more to negative belonging in class, more likely to rely on self
- Internal attributions connected more to negative belonging in math as a field/subject or among peers, more likely to rely on others

METHODS

Participants and Recruitment

- Five focus groups ($n = 18$) of diverse participants in college or within two years of graduation
- We recruited from local college campuses' identity-based affinity groups
- Have overcome challenges in learning math to achieve academic success
- Questions included identifying challenges, connecting to their sense of belonging, strategies to overcome, and advice for learners with similar challenges

Codebook

- Experiences related to student, school, family (+/-)
- Supports and resources related to people and content (+/-)
- Identity and belonging related to peers, math as a field/subject, math classes, other classes, potential careers, in general (+/-)
- Persistence related to field/subject, specific math class, test/assignment, in general (+/-)

Thematic analysis

- Convergence within each focus group (social contagion)
- Also common themes across all focus groups
- Themes emerged within challenges, related experiences, and persistence to overcome
- Also found themes connecting the three

CONSIDERATIONS

Significance

- Presented students' experiences in their own voices.
- Highlight factors that may have received less previous attention in research (e.g., sense of ownership and autonomy)
- Capture challenges in math learning more holistically by analyzing multiple challenges across the different focus groups
- Narratives raise vivid examples of the instructional and institutional practices that can support or hinder students' learning and well-being.

Limitations and Future Research

- Specific to the students who shared these narratives
- Our approach could be generalized to create a richer understanding of personal and environmental barriers students face in learning math.
- Future research can continue this work by developing supports for students who face similar challenges to remove or minimize barriers to future math success.

Discussion Points

- Member Checking
- Scope
- Questions / preparing for review process
- Target publications

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ABSTRACT

Students' individual experiences can contribute to a richer understanding of the personal and environmental barriers students experience in learning math; however, student voices are infrequently represented in the literature on math learning. We conducted a narrative inquiry study of six focus groups in which students discussed their challenges in learning math, as well as the resources and strategies that helped them overcome barriers. We present the themes that emerged across each focus group, as well as detailed findings from one group's conversations about the participants' family and home environments as they related to their experiences in math. Results suggest that narratives can raise new areas for investigating learning processes and practical suggestions for better supporting math learners.

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Abstract

Students' individual experiences can contribute to a richer understanding of the personal and environmental barriers students experience in learning math; however, student voices are infrequently represented in the literature on math learning. We conducted a narrative inquiry study of six focus groups in which students discussed their challenges in learning math, as well as the resources and strategies that helped them overcome barriers. We present the themes that emerged across each focus group, as well as detailed findings from one group's conversations about the participants' family and home environments as they related to their experiences in math. Results suggest that narratives can raise new areas for investigating learning processes and practical suggestions for better supporting math learners.

Objective

Across all levels of K-12 and postsecondary education, students must manage, contend with, and hopefully overcome, a constellation of personal and environmental barriers to learning that pose risks to achieving academic success (Adelman & Taylor, 2018). At the personal level, gendered (Casad et al., 2017) and racial (English-Clarke et al., 2012) socialization regarding math ability and identity can undermine learning, performance, and persistence in math courses and even as a field in general. Furthermore, school climates where students have negative encounters with teachers and peers or suffer from a lack of resources can exacerbate adverse outcomes for math learners (Jackson et al., 2020). These personal and environmental challenges can also lower students' confidence in math ability and increase math anxiety (O'Leary et al., 2017) and even influence students' decisions to access different resources when they need help

in math (van de Sande et al., 2014). Critically, extant research is mostly quantitative and focuses on singular aspects of a student's challenges in learning math. As such, the goal of our study is to understand the complex interplay of personal and environmental barriers to math learning by examining detailed, first-person experiences of students who overcame challenges to learning math to achieve math success.

Theoretical Framework

This study is grounded in narrative inquiry, a qualitative methodology that focuses on understanding experiences through the told stories of the participants (Clandinin & Connelly, 2000). This methodology draws heavily from Dewey's (1938) pragmatic philosophy related to experiences, in which he stated that people need to be understood both as individuals and in a social context and that new experiences emerge from previous ones. Thus, the narrative inquiry approach aims at highlighting three dimensions of the lived experience: interaction (i.e., personal and social), temporality, and situation (Clandinin, 2006). Similar methods have been used to describe educational experiences related to graduating (Schaefer & Rivera, 2020) and STEM learning for Black girls (King & Pringle, 2018).

To understand the experiences of students as they overcome challenges to eventually achieve success in math, we organized focus groups for students to share their stories (i.e., interaction) about math learning throughout their academic experience (i.e., temporality), and captured details about the various situations within which their stories took place. By asking open-ended questions and letting the participants decide the direction of the conversations, we were able to capture stories around unique experiences within each of our focus groups. Thus, we were able to provide a more complete picture of different phenomena related to obstacles during math learning.

Methods

Design

To capture both the individual and social nature of lived experience, we conducted focus groups twice per week for about four weeks ($n = 6$). Due to the COVID-19 pandemic, the focus groups were held virtually through Zoom with between two and five participants. During these structured sessions, we posed pre-scripted questions (see Table 1) with follow-up clarification questions as needed.

Participants

The focus group participants ($n = 21$) were students primarily from universities in the northeastern United States, with one student attending a university in the southeastern United States. We recruited from local college campuses' identity-based affinity groups for currently enrolled undergraduates, graduate students, or graduates who had completed their most recent degrees within the last two years. See Table 2 for demographics.

Data Preparation and Analysis

We developed a codebook to capture the experiences and challenges that students shared in the focus groups, with attention to experiences with support and resources, identity and belonging, and persistence. Our code development included both deductive coding based on current literature and inductive coding based on emergent ideas from the focus group data (see Tables 3-6).

For each focus group transcript, two researchers coded the students' dialogue independently before meeting to discuss any discrepancies and reconcile disagreements in their coding. These double-coded transcriptions resulted in an overall interrater reliability above 80%, with 100% reconciled agreement.

Finally, for each focus group, we wrote short summaries for each participant's responses and then looked across the summaries and codes for all members of the focus group to derive a central theme for each focus group. We found that the conversations within each focus group converged around a central theme, with sub-themes related to experiences, belonging, resources, and persistence. That is, for each theme, more than half (if not all) of the participants shared a story related to the topic. Using a narrative inquiry approach, we tell the students' stories around each of these themes.

Results

We have chosen to present the detailed, but truncated for space, findings from only Focus Group 2 (FG2), in which the conversations focused on the participants' family and home environments. The full paper will include findings from all groups, based on the themes presented in Figure 1.

FG2: Family and Home Environment

FG2 consisted of five participants: Maria, Julio, Omar, Leslie, and Robin (pseudonyms), all from the same university. The demographics of the group are three females, one male, one unspecified; two Hispanic, two Asian, one unspecified; two STEM majors, two non-STEM majors, and one unspecified (although they mentioned using math frequently in their major).

International Relocation

Robin, Maria, and Leslie all indicated that they moved to the U.S. from other countries when they were younger and discussed how cultural and language differences impacted their learning. Robin moved before kindergarten and discussed the challenges related to mathematical word problems, compared to numerical problems. She stated, "a lot of the problems that were in English, I had a lot of trouble doing that kind of math because I was facing both the math

difficulty and then also the language barrier.” Maria moved in middle school and stated similar difficulties related to the process of “translating what you learned in a different language and trying to apply it in a different language.” Moreover, Maria mentioned moving from Mexico as being a “culture shock” and how it was the “first time [she] realized that [she was] a minority.” Finally, Leslie echoed the other’s sentiments, adding that her peers “assumed the Asian stereotype of Asians [being] good at math,” causing her to feel “extra weight added on in addition with the language and trying to translate problems.”

Family Support

All five of the participants noted difficulty in getting help from family members. For example, Robin noted that her parents had learned math differently in China compared to how she was being taught in the U.S. This caused her mom to “also get frustrated” and want to do it the way she knew how to, but Robin wanted to “do it the way that [her] school taught her.” Moreover, Robin discussed how her mom’s schedule prevented her from staying after school to get help, which she referred to as a “little bit of a disadvantage because [she thought] it meant [she] couldn’t rely on extra help outside of school to catch up.” Several participants also acknowledged that being first-generation college students made it difficult to rely on their parents for higher education information or help with advanced mathematics. Moreover, sibling support, or lack thereof, also influenced participant experiences. Omar was an only child and described how their friends had older siblings that could “relay the information that they were currently going through,” adding that it was “difficult to find that helpful resource and mentor being an only child.” Similarly, Maria noted that she had siblings, but could not look to them for any math help.

Different Than Others

Each participant noted feeling different than their peers for a variety of reasons related to their family and home environment. For instance, Omar stated:

“I think not having that resource to help you out when you were at home, a lot of the time, it felt like I had a disadvantage compared to my other peers in class and whatnot. So, I think going into that, it was almost this unconscious effect of me thinking that I'm not as good as other people in my class, which made me more insecure about certain things and more anxious about whether or not I'm learning at a similar rate as everyone else around me is.”

Maria noted that she “didn't really see a lot of people that looked like [her] be super confident in math classes and things like that” and that “it was always boys that were super confident.” Consequently, this made her “question [her] ability to do things.” Leslie said that because of the Asian stereotype, she felt like she “wasn't good enough to be in a specific math class because [she] felt like everyone was better than [her] at math.”

Interestingly, Julio noted that in middle and high school, his sense of belonging was not bad because most of his classmates were “all minorities.” He stated, “Everybody is mostly the same socioeconomic class. So, we all kind of felt the struggle,” but that “it was more apparent to me in college being like, okay, I see some difference in preparation,” and he felt “like [he was] missing something.”

Seeking Help Elsewhere

The participants discussed stories related to seeking help from their teachers because they often could not get help at home. Specifically, the participants who mentioned language barriers discussed how English as a Second Language (ESL) teachers were often a positive resource for them. Importantly, because of their negative sense of belonging, some mentioned that they did

not feel comfortable asking questions in class. Maria noted that she “didn't want people to know [she] was struggling,” causing her to avoid asking for help altogether. Instead, she would “just kind of do extra work on [her] own by “find[ing] practice problems or something like that, that [she] could do by [her]self so that people didn't know [she] was struggling.” Although she believed that it eventually worked, she retrospectively thought it would have been better if she had just asked the teachers for help. Others in the group also shared their experiences with doing extra problems on their own (Leslie) and “taking the initiative and attempting to recognize weaknesses in a certain category” (Omar).

Summary

The conversation from FG2 captured different aspects of an important and often overlooked, non-academic challenge that students face during math learning. It is critical to consider how students' families and home environments can impact students' understanding of math problems, their ability to get help at home, their sense of belonging in the class and among peers, and their access to and willingness to participate in support from teachers.

Significance

While many prior studies have examined the personal, social, and environmental barriers students face in learning math, students' experiences are rarely presented in their own voices. These rich, contextualized narratives of students' experiences make several important contributions to theory and practice. While many of the themes that emerged across our focus groups have been previously identified in the literature (e.g., barriers that immigrant parents experience in supporting their children's math learning; Civil & Planas, 2010), these narratives highlight factors that may have received less previous attention in research, such as the sense of ownership and autonomy suggested in students' experiences of guiding their own learning.

Moreover, by capturing multiple challenges across the different focus groups, we aim to highlight challenges in math learning more holistically. Students' stories about their learning experiences can also provide an instructional purpose for educators, as these narratives raise vivid examples of the instructional and institutional practices that can support or hinder students' learning and well-being. For example, the common theme of students avoiding asking questions in class suggests teachers should be proactive in creating low-stakes and one-on-one opportunities to assess students' understanding and offer support. Our results are specific to the students who shared these narratives, but our approach could be generalized to create a richer understanding of personal and environmental barriers students face in learning math. Future research can continue this work by developing supports for students who face similar challenges to remove or minimize barriers to future math success.

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Table 1

Research Protocol for the Focus Groups

Questions asked in every focus group; sent out to participants before the meeting.*

Q1	What challenges have you specifically had learning math that you think other people may not have had?
Q2	How did these challenges affect your sense of belonging in math classes, school, organizations, etc.?
Q3	How did you overcome these challenges to experience success?
Q4	How have your personal experiences influenced the way you faced new challenges while learning math?
Q5	What advice do you have for learners experiencing similar challenges? (or your younger self)

Questions asked if there was time left after the first five questions.

Q6	Some of you may have already discussed this, do you have any stories that might resonate with middle and high schoolers?
Q7	Please describe someone who influenced you to get into math/STEM.
Q8	Do you consider yourself to be a “math person”? Why or why not? (if clarification needed, follow up with: What would you say makes someone a “math person”?)
Q9	What math achievement are you most proud of? Why?
Q10	What other (more common) challenges did you experience while learning math? (K-12 or college)

*Note: The questions were not sent out to the FG1 before the meeting. We realized afterward that the discussions would be much richer if the students had more time to think about the questions beforehand and sent them out to each of the other focus groups.

Table 2

Demographics for Participants

Demographic	Value	Frequency	%
Race/Ethnicity	Asian	3	15.79%
	Black or African-American	4	15.79%
	Hispanic, Latino, or Spanish origin	4	15.79%
	White	1	5.26%
	Multiple selected	1	5.26%
	Other specified (Middle Eastern)	1	5.26%
	Unspecified*	7	36.84%
Gender Identity	Man	4	21.05%
	Woman	10	52.63%
	Unspecified	7	36.84%
Major	STEM	11	57.89%
	non-STEM	3	15.79%
	Unspecified	7	36.84%
Year of Graduation	2020	1	5.26%
	2021	4	21.05%
	2022	5	26.32%
	2023	4	21.05%
	Unspecified	7	36.84%

*Note: Data is from an optional demographic survey. Unspecified refers to participants who did not complete the survey.

Table 3

Experiences/Challenges Codes with Definitions and Examples

Code	Sub-Code	Definition	Examples
Student			
	Citizenship	Discussed their (or their family's) citizenship status. Includes moving from another country or a reference to being immigrants or immigration	"My parents weren't citizens so..."
	Confidence	Reference to being either confident or insecure	"Scoring only average definitely put a hit to my self-confidence."
	Culture	References to how their culture impacted learning or cultural differences with others	How their parents' culture impacted them
	Emotions	How their emotions impacted their learning (state not trait)	"I would get so frustrated and couldn't focus." OR "My parents would get frustrated trying to help me."
	First-generation status	Discussed how their status as a first-generation college student affected their learning, etc.	"I was a first-gen so I didn't know much about going to college."
	Gender	How their gender impacted their learning	"There weren't a lot of other girls in the class."
	Giftedness/ Talented/ Genetic	Status of being gifted, talented, or inheriting math abilities	"I was in gifted programs."
	Language/ Fluency	Having English as a second language or having to learn English	"I moved here when I was 6 and had to learn English."
	Major/Minor	Experiences related to their chosen major in college	"There aren't a lot of people like me in my major."
	Mood disorders	How mood disorders impacted learning, performance, etc.	Anxiety, depression as a trait, rather than a state (emotions)
	Motivation/ Effort/Interest	Their motivation, interest, willingness, or effort in learning math	"I didn't think it was very relevant."
	Neuro- divergence	How their learning disabilities, autism, etc. impacted their learning	"I was diagnosed with ADHD."

School	Performance/ Grades	Their performance or achievement in math/STEM	“I failed math classes in college.”
	Personality	How different elements of their personality impacted their learning including being shy/talkative, introverted/extroverted, etc.	“I was shy and didn't ask questions.”
	Race/Ethnicity	How their own race/ethnicity impacted their learning	“I am the only Black person in the class.”
	SES	Socioeconomic status	“My family didn't have a lot of money growing up.”
	Understanding math concepts	Their understanding or misunderstanding of concepts in math classes, discussions about math being difficult	“I couldn't figure out how to solve equations.”
	Peer relationships	Interactions with other students	“I would study with my friends.”
	Prior experiences with math	How previous experiences with math affected later experiences	“I was misplaced in algebra, which made math in high school hard.”
	School environment	Structures within the school and/or extracurricular activities; their type of school (e.g., public or private); curricular	“Our school offered lots of AP courses.”
	Support structures	Programs and structures within the school (or after school) that influence performance, learning, etc.	“We had a great ESL teacher.”
	Teacher methods/ instruction	How the teacher taught math	“I had to take the class online.”
Teacher relationships	Interactions between the teacher and student	“My teacher didn't like me.”	
Tracking	How the math level in which they were placed impacted their learning	“I got put in the honors class, which was really hard for me.”	

Family

Familial commitments	Responsibilities at home they had that impacted their learning	“I had to take care of my little sister.”
Home environment	Structures at home that impacted their learning	“We didn’t have internet at home.”
Parental guidance	Ability of their parents to help them with math	“My parents couldn't help me with my homework.”
	Or how their parents supported or hindered their learning	Or “My parents wanted me to be a lawyer.”
Parents’ schedule	How their parents’ schedules impacted their performance, learning, etc.	“My parents were too busy to pick me up from after school tutoring.”
Relocation	Moving to a new location (including internationally)	“We moved a lot when I was a kid.”

Valence

Positive	Participant discusses experience as positive (or benefit, leading to positive outcome)	Teacher encouraged them to get into STEM
Negative	Participant discusses experience as negative (or challenge/barrier)	Their shyness made it difficult to ask questions
Mixed	Describes both negative and positive parts of the experience	“I liked the class, but it was really hard.”
Unspecified	When they mention the experience, they do not designate a positive or negative value	“I was a first-generation college student.”

**Grade/
Age**

Before elementary	Referring to learning before they entered K-12	“I moved to the U.S. when I was three.”
Elementary school	Referring to K-5, elementary, or primary	“My third-grade teacher was mean.”
Middle school	Referring to 6-8, middle, junior high	“I had to take algebra online in 8 th grade.”

High school	Referring to 9-12, high school, senior high	“I took pre-calculus in my junior year of high school.”
K-12 generic	Referring to before college, but do not specific a grade or talk about multiple grades	“Before college I liked math.”
College (undergraduate)	Referring to undergraduate experiences	“Last semester I had a difficult professor.”
Graduate school	Referring to experiences while pursuing an advanced degree	“While I was getting my master's...”

Table 4

Supports/Resources Codes with Definitions and Examples

Code	Sub-Code	Definition	Examples
Using People as resources	Family	Seeking help from people at home (parents, siblings, etc.)	Asking mom for help with homework
	Mentor/Role model	Seeking help from mentor or role model	“I got a lot of advice from my youth pastor.”
	Other school staff	Seeking help from other school officials that are not directly affiliated with the class (principals, other teachers, etc.)	Ask principal for help with teacher
	Peers	Seeking help from peers or friends	Asking friends how they solved a problem
	Private tutor	Seeking help from private tutor (not affiliated with class or school)	Hiring a private tutor to help with learning math
	Support services	Seeking help from guidance counselors, advisors, support centers on campus, etc.	Seeking help from an ESL teacher
	Teachers	Seeking help from teachers, teaching assistants, etc.	Staying after school for tutoring
Using math resources	Class notes	Referring to notes taken in class for help	Looking over notes taken in class
	Enrichment/ Out-of-school programs	Referring to supplemental programs or activities that impacted learning	Enrolling in summer math programs
	Online	Seeking help from online videos, forums, tutorials, or google searches	Using Khan academy for help
	Other books	books other than textbook assigned in class	using workbook from library

Valence	Unspecified resources	unspecified	
	Textbook/course material	Referring to textbook or course materials for help (those assigned in class)	Reviewing examples in textbook
	Positive	Resource was used and helpful	“I would say professors are definitely helpful, or they've been really helpful in the past year or two for me.”
	Negative	Resource was not helpful or the student did not have access to the resource	“I had teachers that were, I would say, belittling in some respect.”
	Mixed	Positive and negative for the same resource	“I would have some TAs that were some of the best TAs I've had. ... Some professors were just there to do research, so they just threw the material at us.”
	Unspecified	Students did not determine if the resource was helpful or not	“I wouldn't go to class to learn. I would go to class to get material to learn on my own.”

Table 5

Identity and Belonging Codes with Definitions and Examples

Code	Sub-Code	Definition	Examples
Among peers		Sense of belonging with peers	“I also did find organizations where people were very, very similar, who felt this way.”
In general		Sense of belonging in general	
Math as a field/ discipline		Sense of belonging in the field/discipline of math	“Maybe I don't belong at an institution, specifically STEM institutions who are heavily focused on the maths and the sciences.”
Math classes		Sense of belonging in math classes	“I didn't really see a lot of people that looked like me be super confident in math classes.”
Other non-math STEM classes		Sense of belonging in non-STEM math classes	“Everyone in my engineering classes know more than me.”
Potential STEM careers		Sense of belonging in potential career related to STEM.	“I am a math person because I just got hired as a statistician.”
Valence	Positive	Statements of certainty around positive belonging	“I am a math person.”
	Negative	Statements of certainty around negative belonging	“It felt really othering, just to see everyone get good grades and stuff and constantly not.”
	Uncertainty	Uncertain about their belongingness	“I guess I wasn't necessarily enthusiastic about using math.”

Table 6

Persistence Codes with Definitions and Examples

Code	Sub-Code	Definition	Examples
In field/ subject In general In specific math class On test/ assignment Valence		Persistence in math generally	“I chose Art as a major so I don’t have to take math.”
		Without specification of a particular setting	“I just need to keep trying and do as much as I can.”
		Persistence in a specific math class	After failing a test, studying hard to eventually pass
		Persistence preparing or completing a test/assignment	Continuing to study for a test even though it’s difficult
	Perseverance	Persisting through challenges	“Once I knew I could do something, then I'd be like, ‘Okay, what's the next hard thing?’”
	Giving up	Not persisting through challenges	“I chose a major that I wouldn't have to do math in ever again. That's how I overcame it.”
	Mixed valence (persistence)	Persevering then giving up or some other mix of both	“I worked really hard, but eventually changed majors.”

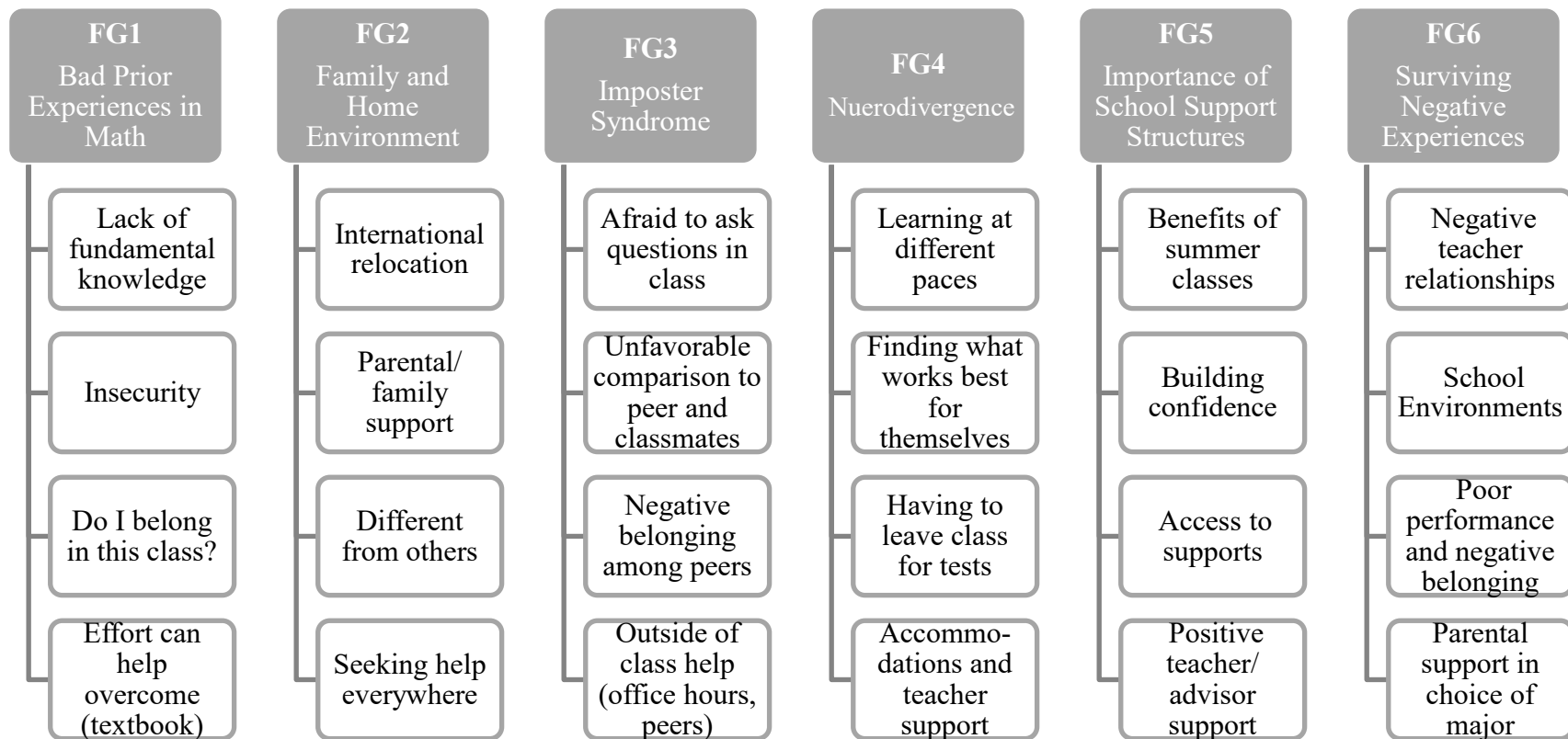


Figure 1: Overview of Themes by Focus Group